

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* LESLIE A. FIELD

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Appeal No. 1999-1871  
Application No. 08/688,337

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ON BRIEF

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Before GARRIS, WALTZ, and TIMM, *Administrative Patent Judges*.  
TIMM, *Administrative Patent Judge*.

***DECISION ON APPEAL***

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1-8, which are all of the claims pending in this application.

### ***BACKGROUND***

Appellant's invention relates to micromachining, and more particularly, to a method for constructing suspending structures such as diaphragms and membranes (specification at 1, ll. 5-

6). Claims 1 and 8 are illustrative:

1. A method for fabricating a suspended structure comprising a layer of membrane material over a substrate, said suspended structure overlying a cavity in said substrate, said method comprising steps of:

generating a sacrificial layer comprising a first material that will remain bonded to said substrate at a temperature greater than 450°C.

depositing said layer of membrane material over said sacrificial layer, said membrane material comprising a second material different from said first material;

opening at least one via in said layer of membrane material thereby exposing said sacrificial layer;

applying a first etchant to said sacrificial layer through said via until said sacrificial layer is removed leaving a portion of said cavity, said first etchant being chosen such that said first etchant removes said first material more rapidly than said second material; and

introducing a second etchant into said cavity, said second etchant being chosen such that said second etchant removes said substrate more rapidly than said second material.

8. The method of claim 1, wherein:

said step of generating a sacrificial layer includes a step of depositing a layer of said first material on said substrate;

said step of opening at least one via in said layer of membrane material defines a location of said cavity in said substrate; and

said step of applying said first etchant to said sacrificial layer through said at least one via is performed for a predetermined time to remove a portion of said first material overlying said location of said cavity in said substrate.

The prior art references of record relied upon by the Examiner in rejecting the appealed claims are:

Holmen et al. (Holmen)	4,784,721	Nov. 15, 1988
Higashi et al. (Higashi)	4,895,616	Jan. 23, 1990
Fan et al. (Fan)	5,364,742	Nov. 15, 1994

Carlos Horacio Mastrangelo, Dissertation, *Thermal Applications of Microbridges*, Univ. of Cal. at Berkeley 274 (1991) (Mastrangelo).

All of the appealed claims stand rejected under 35 U.S.C. § 103(a). To reject claims 1, 3-5, 7 and 8, the Examiner relies upon the Prior Art Statement on page 1 of the specification in view of Higashi as evidence of obviousness. With respect to claim 2, the Examiner additionally relies upon either Mastrangelo or Fan. To reject claim 6, the Examiner relies upon the Prior Art Statement, Higashi and, additionally, Holmen. See the Answer at pages 3-4 for the Examiner's findings of fact and conclusions of law. Because a preponderance of the evidence supports the Examiner's conclusions of obviousness, we affirm. Our reasons follow.

### ***OPINION***

Appellant divides the claims into four groups (Brief at 3) and argues these groups separately (Brief at 3-6). The first group consists of claims 1 and 5-7. The second group consists of claim 2. The third group consists of claims 3-4. The fourth group consists of claim 8. In accordance with 37 CFR 1.192(c)(7)(1998), we select one claim from each group to decide the issues on appeal with regard to the rejections that Appellant contests.

#### ***Claims 1 and 5-7***

As claim 1 is the only independent claim within the group containing claims 1 and 5-7, we select claim 1 to decide the issues on appeal with respect to this group. In general terms, claim 1 is directed to a method including steps of generating a sacrificial layer with certain bonding properties, depositing a membrane layer, opening a via in the membrane layer, removing the sacrificial layer with a first etchant, and etching the substrate with a second etchant.

Higashi describes a process including the steps of claim 1 with the exception that Higashi does not specifically identify a sacrificial layer material that will remain bonded to the substrate at a temperature greater than 450°C as required by claim 1. Rather, Higashi teaches an “aluminum or other selectively etchable layer” for use as the sacrificial layer (Higashi at col. 1, ll. 12-17). Appellant argues that the bonding limitation of claim 1 excludes aluminum and this is not disputed by the Examiner. Instead, the Examiner finds that, as evidenced by the specification at page 1, silicon dioxide was known in the prior art as a selectively etchable sacrificial layer (specification at 1, ll. 18-23). We agree with the Examiner’s conclusion that it would have been obvious to one of ordinary skill in the art at the time of invention to use a sacrificial layer of silicon dioxide in the process of Higashi (Answer at 3). Higashi contains a suggestion to use “other . . . selectively etchable layer[s],” silicon dioxide was a known “other” selectively etchable layer and thus the substitution would have been obvious to accomplish the same end result. Appellant does not dispute that the silicon dioxide of the prior art has the bonding property required by claim 1.

Appellant acknowledges that thermal oxides such as silicon dioxide were utilized in the semiconductor processing arts at the time of Higashi's invention (Brief at 4). However, Appellant argues that if were obvious to substitute a high temperature oxide for the aluminum sacrificial layer taught in Higashi, Higashi would have utilized such an oxide yet nowhere does Higashi mention the use of alternative sacrificial layer material to provide higher process latitude (Brief at 4-5).

Appellant's argument misses the mark. The fact that Higashi does not expressly describe the use of thermal silicon dioxide does not necessarily mean that its use was not obvious to those of ordinary skill in the art at the time of the invention. An express suggestion to substitute one equivalent for another need not be present to render such substitution obvious. *In re Fout*, 675 F.2d 297, 301, 213 USPQ 532, 536 (CCPA 1982). Here, Higashi suggests that other selectively etchable layers can be used as the sacrificial layer and the Examiner has established that silicon dioxide was just such a known sacrificial layer. That is enough to establish a *prima facie* case of obviousness.

### ***Claim 2***

Claim 2 further limits the sacrificial layer composition to phosphosilicate glass (PSG). The Examiner has established that the use of PSG as a sacrificial layer was known in the prior art at the time of invention as evidenced by Mastrangelo and Fan (Answer at 4). Appellant argues that none of the prior art discusses the importance of certain advantages associated with using

PSG as the sacrificial layer and, accordingly, there is nothing in the cited art to cause one of ordinary skill in the art to substitute PSG for aluminum in the process of Higashi (Brief at 5).

Appellant's argument is not persuasive because Higashi suggests that other sacrificial layers can be substituted for aluminum and the Examiner has established that PSG was such a known layer. Thus the Examiner has established that substitution would have been obvious to one of ordinary skill in this art to achieve the same end result.

Whether the references discuss the advantages mentioned by Appellant is of no moment. "As long as some motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor." *In re Beattie*, 974 F.2d 1309,1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992).

#### ***Claims 3-4***

Appellant makes a similar argument with regard to claims 3-4, i.e. that there are advantages to using PSG and oxides (Brief at 5). Again, the fact that there are advantages does not negate the fact that there is a suggestion arising out of the prior art for substituting other known sacrificial layers for aluminum.

#### ***Claim 8***

Appellant contends that claim 8 is directed to a different embodiment in which the position and size of the cavity is determined by the location of the via and the etching time rather than by the extent of the sacrificial layer (Brief at 5; Reply Brief at 3). According to Appellant,

in this different embodiment, the sacrificial layer can extend across the entire wafer. This process is said to require fewer masking steps (Brief at 5; Reply Brief at 3). However, claim 8 does not require that the entire wafer be covered by the sacrificial layer nor does claim 8 exclude masking steps. Furthermore, claim 8 is dependent on claim 1 which recites that the first etchant is applied until the sacrificial layer is removed. Therefore, claim 8 must be read as also requiring removal of the sacrificial layer by the first etchant. We do not agree that claim 8 is directed to a different embodiment.

Appellant argues that the Examiner has not pointed to any teaching in the prior art that would have caused one of ordinary skill in the art to have made “the necessary modifications” (Brief at 5-6). However, the process of claim 8 is rendered obvious for the same reasons as discussed above with regard to claim 1.

### ***Unexpected Advantages***

Appellant states in the Reply Brief that the materials set forth in claims 3 and 4 provide an unexpected advantage (Reply Brief at 3). “[I]t is well settled that unexpected results must be established by factual evidence.” *In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997). Attorney arguments in the Brief cannot take the place of evidence. *In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972). Factual evidence is lacking in the present case.

***CONCLUSION***

We conclude that the Examiner has established a *prima facie* case of obviousness with respect to the subject matter of claims 1-8 which has not been sufficiently rebutted by Appellant.

To summarize, the decision of the Examiner to reject claims 1-8 under 35 U.S.C. § 103(a) is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

BRADLEY R. GARRIS  
Administrative Patent Judge

THOMAS A. WALTZ  
Administrative Patent Judge

CATHERINE TIMM  
Administrative Patent Judge

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APPEAL NO. 1999-1871 - JUDGE TIMM  
APPLICATION NO. 08/688,337

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DECISION: **AFFIRMED**

Prepared By:

**DRAFT TYPED:** 15 Aug 03

**FINAL TYPED:**